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(71) Applicant
Jean Paul Bachoux,
6 Allée du Hameau des
Vieux Capucins, Chartres
(Eure and Loir), France

(72) Inventor
Jean Paul Bachoux

(74) Agents

H. N. and W. S. Skerrett,
Rutland House, 148
Edmund Street,
Birmingham B3 2LQ

(54) A jointed coupling device for
spraying/spreading booms

(57) A spray boom of an agricultural
vehicle comprising a centre section 1
and two movable side sections (only
side section 2 shown). Section 2 is
coupled to end 10 of section 1 by a

jointed coupling device including
suspension mechanism 3 attached at
a high point A on chassis 4. The
coupling device also includes thrust
mechanism 5, comprising springs 50,
51. Suspension mechanism 3 has a
ring 6, vertically adjustable in a slot in
chassis 4, and a stay rod 7. Points AB
define an axis about which section 3
can be swung to a forward position for
transport and points AC define an axis
about which section 2 can be swung
to a rearward position on striking an
obstacle.

Fig.1

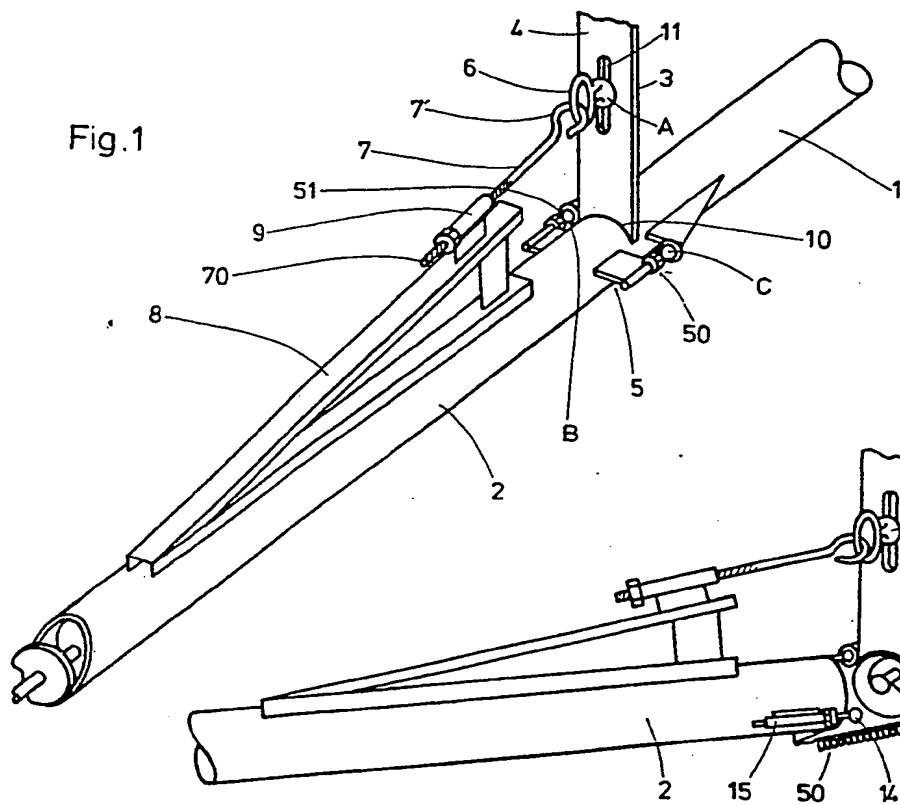
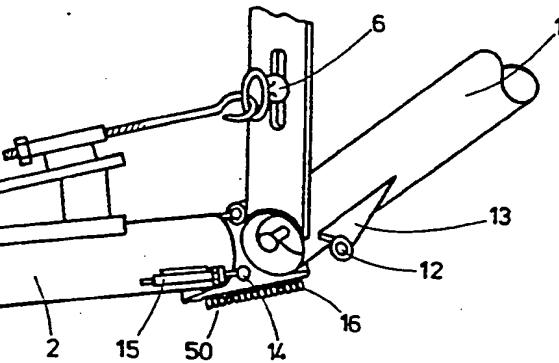


Fig.2

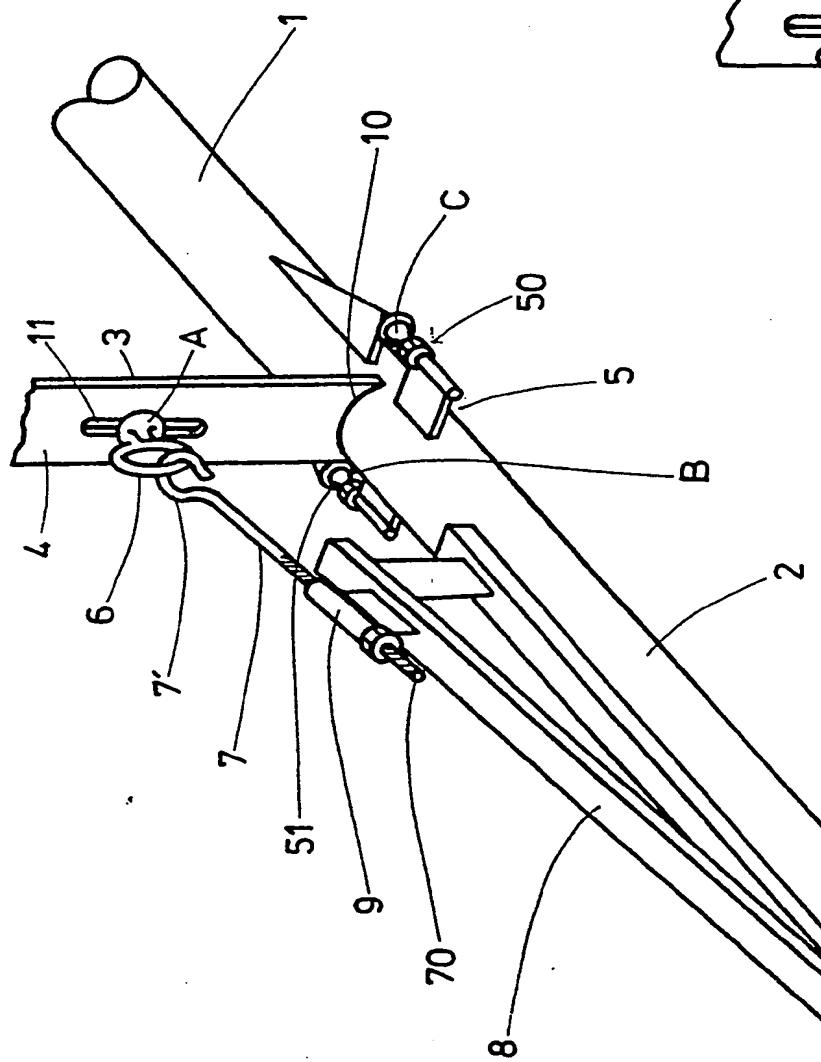


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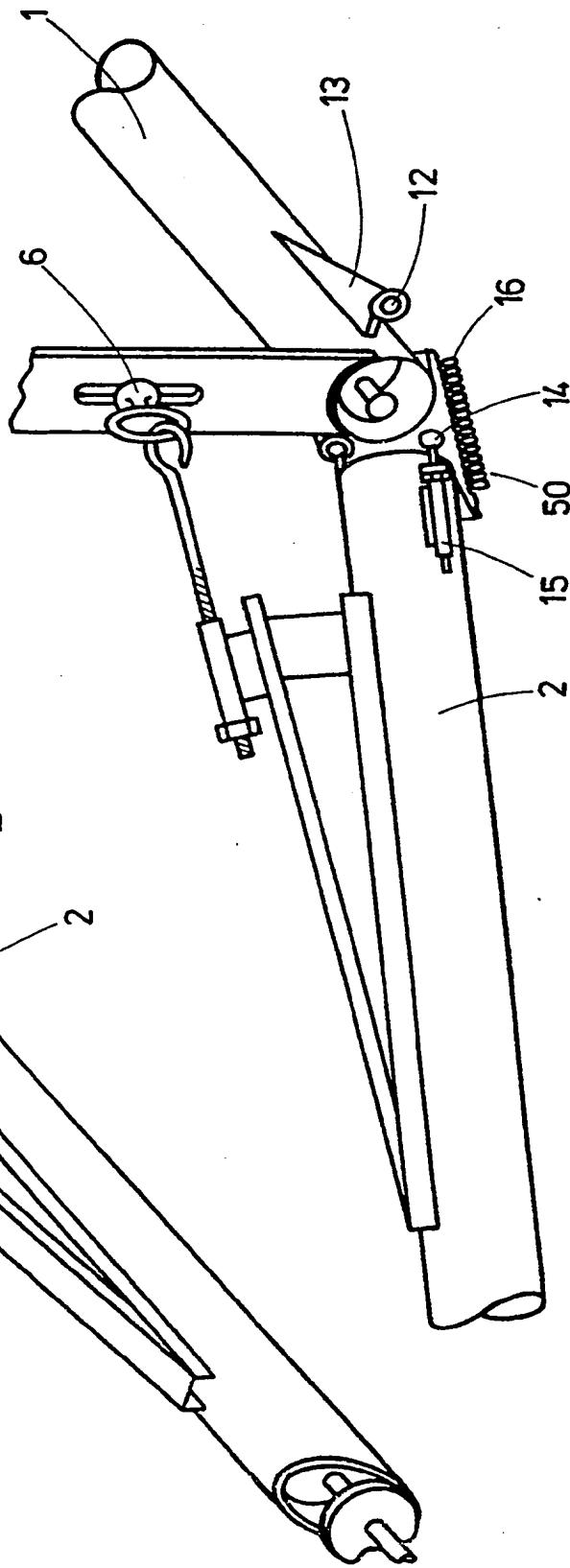
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Fig. 2



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SPECIFICATION**A jointed coupling device for spraying booms: spraying boom**

The invention relates to a jointed coupling device for spraying booms. There is described herein a spraying boom consisting of a centre section fixed to the chassis of an agricultural vehicle and two movable side sections linked respectively to either side of the centre section and axially alignable therewith.

The device may be used in manure or soil improver (for example, fertilizer) spreader vehicles which vehicles are required to drive on roads on the way to the fields and yet still remain within authorised limits, as well as on agricultural terrain where the greatest possible working width of the spraying boom is usually desired.

There have been proposed booms for spreading manure or soil improvers which consist of an Archimedean screw rotating within a cylindrical casing, which casing has an opening in its lower section to allow the product to be applied to the soil.

There has also been proposed a double jointed coupling device with which a boom can:

- (a) be placed in the working or spraying position in which the boom is perpendicular to the axis of the agricultural vehicle to which it is fitted, and approximately horizontal,
- (b) be placed in a transport position in which the side sections of the boom are folded towards the front along the body of the vehicle, in order to travel on roads,
- (c) be placed in a retraction position in which

the side sections of the boom are folded towards the rear in order to prevent any damage to the assembly in the case of encountering obstacles.

According to one aspect of the present invention there is provided a jointed coupling device for folding axis spraying booms consisting of a centre section attached to the chassis of an agricultural vehicle, and two movable side sections which are linked respectively to either side of the centre section and which movable sections can be moved from a working position, in which the boom is perpendicular to the axis of an agricultural vehicle to which it is fitted and approximately horizontal, to a transport position, in which the side sections of the boom are folded towards the front along the body of the vehicle, and to a retraction position, in which the side sections of the boom are folded towards the rear in order to alleviate risk of damage to the assembly in the case of contact with an obstacle; a jointed coupling device, characterised in that said device consists of a suspension mechanism to attach one of the movable side sections of the boom to a chassis, forming an integral part of the fixed centre section, at a high point which is subjected to a pressure load, as well as a thrust mechanism at a low point under compression which allows a side section to be pivoted from the working position to the transport or retraction positions, with the working position being a

position of equilibrium between the pressure and compression forces.

The jointed coupling device may allow one of the movable side sections of the boom to be hooked to a chassis, which is an integral part of the fixed centre section, at a high point which is subject to tensile stress, and a thrust mechanism at a low point subjected to a compression load and allowing one side section to be pivoted from the working position to the transport or retraction positions. In this system, the working position corresponds in fact to a position of equilibrium between the tensile forces and the compression forces which are applied to the device.

In accordance with one embodiment of the invention, the thrust mechanism consists of two thrust elements, which are located on either side of the end of the fixed boom section and determine the two folding axes of said one of the movable side sections from the working position; one of these axes corresponds to the folding movement towards the transport position, whilst the other corresponds to the folding movement towards the retraction position.

The two axes which allow the movement of said one of the movable side sections of the boom towards the front and rear are virtual and provided by three coupling and thrust points. This configuration prevents serious corrosion problems, which are otherwise difficult to resolve given the nature of the products which are spread. Its simple design also allows substantial savings in its manufacture.

According to another embodiment of the invention, the suspension mechanism and the thrust mechanism are adjustable by setting or adjusting elements, which allow adjustment of the position of said one of the movable side sections of the boom in relation to the fixed section.

The suspension mechanism may consist of a ring fixed to the chassis (which chassis may form an integral part of the fixed boom section) above the end on which is mounted said one movable section and a stay rod, one end of which is attached to said one movable side section and the other end being in the shape of a hook and cooperating with the ring attached to the fixed boom section. The thrust elements are formed by cups attached to the fixed section of the boom and swivel joints attached to said one movable side section.

As already mentioned, the working or spraying position represents a position of equilibrium of the system. It is, nevertheless, possible to add an appropriate locking mechanism or a release spring which would prevent the respective swivel joint involved in the rotary movement from leaving its cup; this configuration increases the stability of the assembly.

Preferably, the adjustment of the suspension and thrust mechanisms is such that said one movable boom section is raised during its movement to the retraction position and/or forward position. This arrangement is of particular interest with regard to the prevention of damage if

the boom end should accidentally touch the ground.

According to a second aspect of the present invention there is provided a spraying boom

- 5 comprising a first elongated section fixed in use relative to a support such as a vehicle chassis, or integrally formed therewith, and at least a second elongated section which is movable relative to the first section and biased to end to end relationship
- 10 with the first section and thereby to a working or spraying position, said second section being rotatable about the end of the first section to a forward position and to a rearward or retracted position, said second section being connected to
- 15 the first section by coupling means comprising a suspension mechanism which is subjected by the second section to a tensile load in use, and the coupling means also comprising a thrust mechanism which is, in use, vertically spaced from
- 20 an attachment point of the suspension mechanism, the spraying or working position being a position of equilibrium between the suspension and thrust mechanisms, said attachment point of the suspension mechanism
- 25 being for example on the chassis or on an integral part of the first section.

The characteristics of the jointed coupling device and/or spraying boom to which this invention relates, will be described in greater detail with reference to the accompanying drawings, which show, by way of example only, an embodiment of the invention and without being limitative.

In these drawings:

- 35 Figure 1 shows the jointed coupling device in the working or spraying position;
- 30 Figure 2 shows the same device during its movement towards the transport position.
- 40 Figures 1 and 2 show the coupling of a movable side section 2 to the end 10 of a fixed centre section 1 of a spraying boom. In this example, section 1 has a similar movable section (not shown) attached to the other end, which is opposite end 10.
- 45 As shown by the drawings, the jointed coupling device consists of a suspension mechanism 3, which allows the section 2 to be attached to a chassis 4 (which chassis forms an integral part of the fixed section 1) at a high point A and under
- 50 tensile stress. The coupling device also includes a thrust mechanism 5, which is subjected to a compression load and allows the side section 2 to be pivoted from the working position shown in Figure 1 to the transport position (as shown) in
- 55 Figure 2 or the retraction position (not shown in the drawings).

In accordance with the drawings, the thrust mechanism 5 consists of two thrust elements 50 and 51, which are located on either side of end 10 on the fixed section 10 and control two independent folding axes around two points B and C of the side section 2, starting from the working position. Point B corresponds to the folding operation towards the transport position, whilst

65 point C corresponds to the folding operation

towards the retraction position.

The suspension mechanism 3 consists of a ring 6, which is attached to the chassis 4 forming an integral part of the fixed section 1 above end 10,

- 70 as well as of a stay rod 7; end 70 of rod 7 is attached to the movable section 2 by means of an angle iron 8, for example, whilst end 71 is in the shape of a hook coupled to the ring 6 attached to chassis 4.
- 75 Setting or adjusting elements are provided to adjust the position of the movable side section of the boom in relation to the fixed section.
- 80 These setting or adjusting elements include a thread at end 70 of stay rod 7 which is connected to the screw thread of a nut 9, said nut being mounted on the angle iron 8 for this purpose. The elements also include a slot 11 in which the position of ring 6, and thus the fixing point A can be adjusted.
- 85 The thrust elements 50 and 51 are constituted by cups 12 linked to the swivel joints 14, which joints 14 are attached to the movable section 2 by means of threaded rods 15 for the adjustment of their position.
- 90 The device also comprises release springs 16 which increase the stability of the assembly in the working position by increasing the force with which the movable section is held in this position.
- 95 It is also envisaged that a metal part may be placed over each swivel joint 14 which must not hinder the movement of the movable boom section whilst it is pivoting around the other swivel joint, but which would pass underneath the support cup 12 and prevent it from jumping out of its position during the rotary movement.
- 100 During operation, the above-mentioned triangle between points A, B and C is subjected to the weight of the boom. This force consists of the following:
- 105 — a component (tensile) depending on the direction of stay rod 7 which is applied at the high suspension point A,
- a horizontal component (compression) which is applied to the lower thrust points B and C on the boom extension.
- 110 Starting from the equilibrium position of A, B and C as shown in Figure 1, it is necessary to apply a force which is greater than the weight component applied by the boom on the rear element or stop C (12, 14) in order to fold the movable section 2 into the transport position. The movable section 2 then pivots around the virtual axis AB as shown in Figure 2, an axis which was chosen so as to bring the extension (section 2)
- 115 into the most favourable position along the body of the vehicle (not shown). In this movement, which is carried out either manually or possibly by means of a hydraulic jack, the swivel joint 14 freely moves out of and away from cup 12.
- 120 In the same way, an adequate force applied towards the rear produces a rotation of the movable section 2 around the virtual axis AC. The direction of this axis has been chosen so as to raise the movable section 2 in its movement
- 125 towards the rear. This arrangement is of particular
- 130

interest with regard to preventing any breakage of the boom if its end should accidentally touch the ground. The movable section 2 moves up and to the rear, thus helping the user against damage to his equipment.

The angles of the two axes AB and AC in relation to a vertical line also cause the movable section 2 to be returned to its working position, which remains in a stable position of equilibrium 10 within the confines of the probable movements of the equipment.

Due to the nature of the elements used and the minimum contact between metal surfaces, the double coupling system according to the invention 15 is highly corrosion-resistant. It is therefore particularly suitable for the spreading of products such as manure or corrosive and oxidizing soil improvers.

CLAIMS

- 20 1. A jointed coupling device for folding axis spraying booms consisting of a centre section attached to the chassis of an agricultural vehicle, and two movable side sections which are linked respectively to either side of the centre section
- 25 and which movable sections can be moved from a working position, in which the boom is perpendicular to the axis of an agricultural vehicle to which it is fitted and approximately horizontal, to a transport position, in which the side sections 30 of the boom are folded towards the front along the body of the vehicle, and to a retraction position, in which the side sections of the booms are folded towards the rear in order to alleviate risk of damage to the assembly in the case of contact 35 with an obstacle; a jointed coupling device, characterised in that said device consists of a suspension mechanism to attach one of the movable side sections of the boom to a chassis, forming an integral part of the fixed centre section, 40 at a high point which is subjected to a pressure load, as well as a thrust mechanism at a low point under compression which allows a side section to be pivoted from the working position to the transport or retraction positions, with the working 45 position being a position of equilibrium between the pressure and compression forces.
2. A jointed coupling device in accordance with Claim 1, characterised in that the thrust mechanism consists of two thrust elements 50 located respectively on either side of the end of the fixed boom section and determining two independent folding axes of said one movable side section from the working position; one of these axes corresponds to the folding movement into 55 the transport position, whilst the other corresponds to the folding movement into the retraction position.
3. A jointed coupling device in accordance with Claim 1 or 2, characterised in that the suspension 60 mechanism and the thrust mechanism have setting or adjustment elements for the adjustment

of the position of said one movable side section on the boom in relation to the fixed section.

4. A jointed coupling device in accordance with 65 any one of Claims 1 to 3, characterised in that the suspension mechanism consists of a ring attached to the chassis, which forms an integral part of the fixed boom section, above the end which is to receive said one movable section, as well as a stay rod of which one end is attached to said one movable side section whilst the other end is in the shape of a hook linked to the ring, which is attached to the fixed boom section.

5. A jointed coupling device in accordance with 75 any one of Claims 1 to 4, characterised in that the thrust elements consist of cups attached to the fixed boom section and connected to swivel joints on said one movable side section.

6. A jointed coupling device in accordance with 80 Claim 5, characterised in that it includes a locking mechanism to prevent the respective swivel joint involved in the rotary movement from leaving its cup.

7. A jointed coupling device in accordance with 85 any one of Claims 1 to 6, characterised in that the setting of the suspension mechanism and the thrust mechanism is such that said one movable boom section is raised during its movement towards the retraction position.

8. A spraying boom comprising a first elongated section fixed in use relative to a support such as a vehicle chassis, or integrally formed therewith, and at least a second elongated section which is movable relative to the first section and 90 biased to end to end relationship with the first section and thereby to a working or spraying position, said second section being rotatable about the end of the first section to a forward position and to a rearward or retracted position,

95 100 said second section being connected to the first section by coupling means comprising a suspension mechanism which is subjected by the second section to a tensile load in use, and the coupling means also comprising a thrust mechanism which is, in use, vertically spaced from an attachment point of the suspension 105 mechanism, the spraying or working position being a position of equilibrium between the suspension and thrust mechanisms, said

110 115 attachment point of the suspension mechanism being for example on the chassis or on an integral part of the first section.

9. A spraying boom as claimed in Claim 8 in which the second section is rotatable about said end of the first section to said forward position about a first axis and rotatable about said end of the first section to said rearward or retracted position about a second axis.

10. A spraying boom substantially as herein described with reference to the accompanying drawings.

11. A spraying boom as claimed in Claim 8 in which the suspension mechanism and coupling

means are substantially as herein described with reference to the accompanying drawings.

12. A vehicle including at least one spraying

boom as claimed in any one of Claims 8 to 11 or
5 at least one jointed coupling device as claimed in any one of Claims 1 to 7.

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